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(54) Name of the invention: Method for Disinfection (Sterilization) and Preservation of Food Products

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Patent Assignee: Riken Vitamin Oil Company

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Note: Names, addresses, company names and brand names are translated in the most common manner. Japanese language does not have singular or plural words unless otherwise specified by a numeral prefix or a general form of plurality suffix.

Description of the invention

1. Name of the invention

Method for Disinfection (Sterilization) and Preservation of Food Products

2. Scope of the claims of the invention

1. Method for preservation of food products, characterized by the fact that a technological process where one type of glycerin monoaliphatic acid ester, where the number of the carbon atoms of the aliphatic acid is in the range of 8 ~ 12, or a mixed material containing two or more types of those, or a composition material where this and a metal ion chain terminating agent, have been employed together, are used, and the food product or food product raw material are treated, and a technological process where a low temperature heating is conducted at a temperature in the range of 45oC ~ 70oC, are conducted at the same time or separately.

3. Detailed explanation of the invention

The present invention is an invention about a method for the preservation – disinfection of food products or food product raw materials, and especially in more details, it is about a method where by conducting a low temperature sterilization at temperatures of at least 45oC or higher, at the time (or succeeding) a treatment conducted by using a glycerin aliphatic acid ester individually, or a composition material where to that a metal ion chain termination agent, has been used at the same time, the sterilization and preservation properties of the food product are improved.

Usually, in the case of the food products, there are cases where at the time of the harvesting of the raw materials they are soiled by microscopic organisms by the technological processes or by the circulation technological process, etc., and they decay and the price of the sold product is significantly decreased, or because of the decease causing bacteria, they become sources of poisoning.

For the wide regional circulation and large scale sales during the recent years, the elimination of the change of the quality and the change of the properties, and naturally, from the point of view of the hygiene, also stable food products have been highly required. Because of that, in order to increase the preservation (storage) properties of the food products different types of preserving agents have been added, and different types of sterilization materials, have been used. However, in the case of these preserving agents and sterilization materials, because of their toxicity properties relative to the human body, the food products where those have been added and used, and their added or used amounts, have been controlled, and it is well known that sufficient results cannot be obtained.

In contrast to the above described chemical method, the washing, heating sterilization, ultra-violet light sterilization etc., physical methods also have been used, however, in that case a complete sterilization – disinfection has been difficult, and there are cases where this has been accompanied by a deterioration of the taste and the smell, and also the installation used is complex, etc., and because of that, it has been difficult to practically implement for all food products.

In the past, it has been known that glycerin aliphatic acid esters obtained from low and medium aliphatic acids show wide bacteria resistant properties, relative to mold, bacteria etc. However, because of their characteristic bad odor and irritating taste, even though they have extremely low toxicity properties, despite that, it cannot be stated that they have necessarily sufficient effect, which is necessary for their consideration as preserving agents for food products.

The authors of the present invention have conducted rigorous experiments in order to efficiently use the glycerin aliphatic ester type materials. And as a result from that, they have observed that if at the time when the food products are treated by using these type of materials, a heating is conducted

to the degree where the appearance, feel or the taste of the food product is not deteriorated, by that the sterilization is accelerated (promoted) and the multiplication of the microorganisms is significantly suppressed.

Also, by using together this glycerin aliphatic acid ester and a metal ion chain termination agent, this sterilization – growth suppression result is significantly aided.

Regarding the glycerin aliphatic acid ester of low – medium aliphatic acids, it is known that among the different types of bacteria, their growth suppression effect on the gram positive bacteria is large, however, the effect relative to the sun bacteria etc., gram negative bacteria, is poor. However, according to the present invention, even the growth suppression effect relative to the sun bacteria, is significantly increased, and coupled with the effect that is inherent originally to the glycerin aliphatic acid esters, the hygiene of the food products and also their preservation properties, are significantly improved.

The method according to the present invention is a method where a mixed material consisting of one or more types of glycerin aliphatic esters derived from caprilic acid, capric acid or lauric acid, is used individually, or a composition material obtained as to that a metal ion chain terminating agent is used together with it, are used, and the food products are treated as these materials are added to them, or they are placed in contact with them, or coated or immersed in them, and a heating is conducted at a temperature that is at least 45oC or higher, and the hygiene of the food products and the preservation properties of the food products are increased. Although there are no specific limitations regarding the state during the usage and the amount used of the above described glycerin aliphatic acid ester material, in the case when it is added, coated placed in contact with the food product or the food product is immersed in it, it is sufficient if it is used in a amount so that the added amount ~ adhered amount to the food product becomes in the range of 0.0005 ~ 1.0 weight %.

As the metal ion chain terminating agent, there are the following agents: metaphosphoric acid, pyrophosphoric acid, polyphosphoric acid, etc., polymerized phosphoric acid salts, phosphoric acid or its salts, hitinic acid and citric acid, malic acid etc., organic acids and their salts, ethylene diamine tetraacetic acid salts, etc.

According to the present invention, in the case of food products like tofu, fish, ham, sausage, etc., products that have undergone a high temperature heating, and naturally, even relative to the types of vegetables and fruits that are weak relative to heat, like cabbage and cucumbers, there is no deterioration of their appearance and taste, and the sterilization is effectively conducted.

There is no specific limit to the temperature of such heating process, however, relative to the sanitation treatment of the food products raw materials, etc., it is sufficient if the temperature is in the range of 45oC ~ 60oC.

After that, practical implementation examples are given and the present invention is explained, however, the present invention is by no means limited by these practical examples.

Practical Example – 1

Grown on a suranto at a temperature of 37oC for a period of 24 hours E.coli and Ps.aeruginosa were suspended in a sterilized water that contains 0.1, 0.25 and 0.5 mM chemical agent, so that the light absorbance at 650 microns (OD650) becomes 0.1. This solution was heated at a temperature of 50oC for a period of 5 minutes and after that 0.2 ml of this were collected in a L letter shaped tube where 10 ml of agar-agar growth medium has been added, and at a temperature of 37oC it was impact grown and the lag time of the multiplication (hr) was obtained.

The results were shown according to the presented in Table 1.

Table 1: Growth suppression effect of the glycerin aliphatic acid ester relative to E.coli and Ps. Aeruginosa

	2	3	lag time (hr)	
1			E.coli	Ps.aeruginosa
4				
5				
6				
7				
8				

Headings in the table:

1. experimental material, 2. added amount, 3. heating, 4. no addition, 5. caprilic acid monoglyceride, 6. capric acid monoglyceride, 7. lauric acid monoglyceride, 8. myristic acid monoglyceride, 9. no, 10. yes.

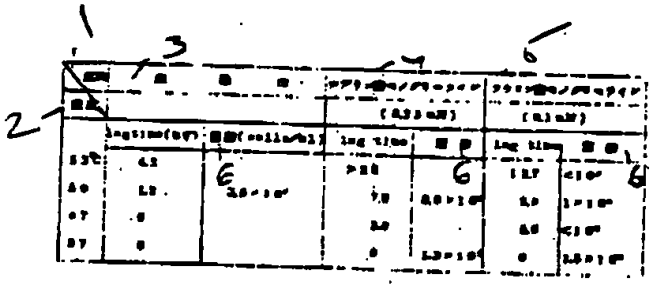
As it is clear from the results shown according to Table 1, in the cases where both glycerin monoaliphatic acid ester treatment and heating treatment were used, a significant lag time extension effect, namely, a growth suppression effect, was observed.

Practical Example –2

According to the same method as the method described in the Practical Example –1, 0.25 mM of capric acid monoglyceride and 0.1 mM of lauric acid monoglyceride were added and after that, a heating was conducted for a period of 5 minutes at temperatures of 37oC, 47oC, 50oC and 53oC, correspondingly, and by that, the growth suppression effect relative to E.coli, was obtained. Also, at the completion of the time period the number of bacteria was measured.

The results are presented according to the shown here below Table 2.

Table 2: Effect of the heating temperature on the E.coli



Headings in Table 2:

1. experimental material, 2. temperature, 3. no addition, 4. capric acid monoglyceride, 5. lauric acid monoglyceride, 6. number of bacteria.

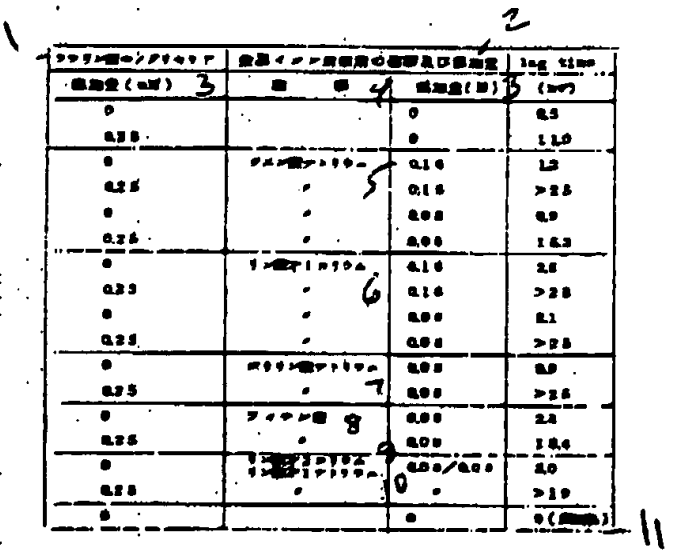
As it is clear from the results presented in Table 2, in the case of the method where the glycerin monoaliphatic acid treatment and the heating treatment were used, a significant growth suppression effect relative to E.coli, was observed, compared to the case where the heating treatment was used.

Practical Example – 3

According to the same method as that used in the Practical Example – 1, 0.25 mM of lauric acid monoglyceride was added and the heating treatment was conducted under conditions where the temperature was 50oC and the time period of 5 minutes, and the effect of the combined use of the metal ion chain termination agent, was studied. The pH of the sterilized water was adjusted to a pH of 7.0 by using a phosphoric acid buffer solution.

The results are shown according to the presented here below Table 3.

Table 3: Results from the combined use of lauric acid monoglyceride and metal ion chain termination agent



Headings in the table:

1. lauric acid monoglyceride, 2. type and added amount of the metal ion chain termination agent, 3. added amount, 4. type, 5. sodium citrate, 6. potassium 1 phosphate, 7. sodium polyphosphate, 8. hitinic acid, 9. potassium 2 phosphate, 10. sodium 1 phosphate, 11. 0 (no heating).

As it is clear from the presented in Table 3, in the case of the method where both the lauric acid monoglyceride and the metal ion chain terminating agent treatments were used in a combination, a significant growth suppression effect relative to the E.coli, was observed, compared to the case of the method where the lauric acid monoglyceride individually, or each of the types of the metal ion chain terminating agents, individually, have been used.

Practical Example –4

A composition material with the following content was prepared.

Capric acid monoglyceride	5 %
Lauric acid monoglyceride	5 %
Polysugar aliphatic acid ester	3 %
Propylene glycol	22 %
Ion exchanged water	55 %
Phosphoric acid 1 potassium	

Growth sterilization studies were conducted. As the experimental design the following here below 4 designs were prepared and these were compared.

A no heat treatment section

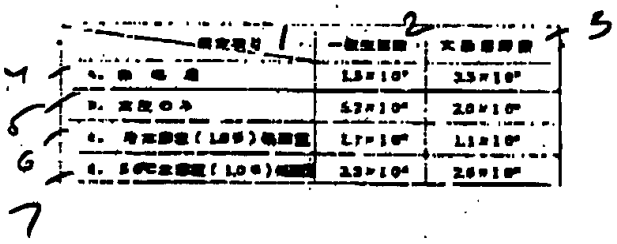
B it was immersed for a period of 5 minutes in a 50oC water way water

C after immersion for a period of 3 minutes in a water way water containing the above described composition material (1 %) (17oC), it was lightly washed with water

D after immersion for a period of 1 minute in a water way water containing 1.0 % of the above described composition material (50oC), it was lightly washed with water

The results from the measurements of the number of bacteria found in each of the experimental sections, were shown according to the presented here below Table 4.

Table 4: Results from the growth sterilization studies (number of bacteria cells/g)



Headings in the table:

1. measured parameter, 2. usual bacteria count, 3. sun bacteria count, 4. a. no treatment, 5. b. water washed only, 6. c. cold water solution treatment (1.0%), 7. d. 50oC water solution treatment (1.0 %)

As it is clear from the results presented in the table in the case of the section conducted according to the present invention where a 50oC water solution treatment (1.0%) was conducted, a significant sterilization effect was observed, compared to the sections where no treatment was conducted, a water washing treatment was conducted, or a cold water solution (1.0 %) treatment, was conducted.

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